INSECT-HOST PLANT INTERACTION IN RELATION TO DEVELOPMENT OF *DIAPHANIA INDICA* (SAUNDERS) (LEPIDOPTERA: PYRALIDAE)[1]

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Various parameters were considered while studying the insect-host plant interaction between *Diaphania indica* (Lepidoptera: Pyralidae) and 18 cultivated cucurbits. Among the cucurbits screened for development of *D. indica*, muskmelon, longmelon, watermelon, pumpkin, squash and ivy gourd were the most preferred hosts while bitter gourd, bottle gourd, chow-chow, pointed gourd and sponge gourd were the least preferred hosts.

INTRODUCTION

The pumpkin caterpillar *Diaphania indica* (Saunders) has been reported from several parts of India and other regions of the world causing damage to various cucurbitaceous plants (Duport 1912, Vayssiere and Mimeur 1925, Esaki 1940, Hutson 1924, BA-Angood 1979). In India Patel and Kulkarny (1956) conducted detailed studies on the biology of this insect pest. Pandey (1975) screened seven cultivated cucurbits at Bharwari for their relative preference to *D. indica*. Krishnaprasad and Rai (1978) screened five cucurbits at Dharwar. However, not much work has been carried out with this insect pest in Tamil Nadu and much less on the insect-host plant interaction. In the present investigation 18 cultivated cucurbits were screened for their relative preference to *D. indica* for development.

MATERIAL AND METHODS

The 18 cultivated cucurbits selected for this study were: (i) musk melon *Cucumis melo* L., *(ii)* long melon *Cucumis melo* var. *utilissimus* Duth. and Full., (iii) round melon *Praecitrullus vulgaris* L., (iv) ridge gourd *Luffa acutangula* L., (v) sponge gourd *Luffa cylindrica* L., (vi) pointed gourd *Trichosanthes dioica* Roxb., (vii) spiny gourd *Momordica cochinchinensis* Spreng., (viii) chow-chow *Sechium edule* (Jacq.), (ix) watermelon *Citrullus lanatus* (Thunb.), (x) bottle gourd *Lagenaria siceraria* (Mol.), (xi) bitter gourd *Momordica charantia* L., (xii) pumpkin *Cucurbita moschata* (Duch.), (xiii) ash gourd *Benincara hispida* (Thunb.), (xiv) snake gourd *Trichosanthes anguina* L., (xv) squash *Cucurbita pepo* L., (xvi) ivy gourd *Coccinia indica* Wight and Arn., (xvii) cucumber *Cucumis sativus* L., (xviii) small gourd *Cucumis melo* var. *agrestis* Naud.

15 of these cucurbits were raised in separate rows of 12 m length. For the remaining three varieties, viz. ivy gourd, snake gourd and small gourd, leaf samples were taken from established fields. For assessing the varietal preference, the following parameters, viz. larval development, larval period, larval weight, pupal period, percentage of pupation, percentage emergence of pupae, growth index, fecundity and field infestation were recorded. The Growth Index was estimated following the method adopted by Srivastava (1959).

The studies were carried out with 10 freshly hatched larvae and three replications were maintained for each variety. The total larval period on each of these varieties as well as larval weight at the end of 10 days were recorded. Fecundity of the moths reared on these hosts was determined by enclosing the mated female moth in the rearing jar on leaves. Three female moths were enclosed separately for each host plant.

RESULTS AND DISCUSSION

Various parameters were considered for

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TABLE 1
INSECT-HOST PLANT INTERACTION IN RELATION TO DEVELOPMENT OF *D. indica*

Host Plant	Larval period (days)	Larval weight (mg)	Pupal period (days)	% Pupation	% Emergence of adults	Growth index	Fecundity	No. of larvae on plant in field
1. Musk melon	9.40^{a}	50.54^{abc}	6.80^{a}	72.66^{ab}	80.84^{ab}	5.85	198.00^{a}	3.98
2. Long melon	10.60^{a}	32.33^{oef}	8.20^{cde}	71.33^{ab}	73.90^{abcd}	5.24	157.80^{cde}	3.52
3. Round melon	15.33^{f}	25.04^{f}	9.10^{def}	58.66^{cd}	61.41^{def}	3.20	79.00^{ef}	1.18
4. Ridge gourd	11.13^{bc}	27.53^{f}	7.80^{abc}	40.00^{ef}	53.53^{ef}	2.79	129.60^{de}	1.16
5. Sponge gourd	13.13^{e}	32.03^{def}	10.30g	29.33^{f}	43.01^{fg}	1.81	28.40^{f}	0
6. Pointed gourd	13.86^{e}	24.48^{f}	7.00^{ab}	31.33^{f}	46.21^{f}	1.85	42.30^{ef}	0
7. Spiny gourd								0
8. Chow-chow	15.26^{f}	47.54^{abcde}	9.30^{ef}	35.33^{f}	42.47^{fg}	1.93	68.70^{e}	0.70
9. Water melon	10.53^{b}	60.62^{a}	7.30^{abc}	76.66^{a}	84.43^{a}	5.66	164.70^{ab}	3.24
10. Bottle gourd	13.40^{e}	37.63^{bcdef}	10.20^{fg}	28.60^{f}	30.55g	1.74	78.40^{ef}	1.17
11. Bitter gourd	15.67^{f}	23.18^{f}	10.20^{fg}	37.33^{ef}	31.26g	1.99	90.60^{ef}	—
12. Pumpkin	11.33^{bc}	50.14^{abc}	7.70^{abc}	74.00^{ab}	74.69^{bcd}	5.16	133.80^{abc}	3.15
13. Ash gourd	12.86^{de}	40.18^{abcdef}	9.70^{fg}	55.33^{cd}	70.95^{abc}	3.48	176.00^{ab}	2.12
14. Snake gourd	12.06^{cd}	34.70^{cdef}	8.10^{bcd}	54.00^{cd}	64.32^{cde}	3.58	100.20^{bcd}	—
15. Squash	11.00^{b}	50.32^{abc}	6.60^{a}	77.33^{a}	82.14^{ab}	5.52	146.40^{ab}	3.23
16. Ivy gourd	10.13^{bc}	53.26^{ab}	7.70^{abc}	76.00^{a}	77.01^{abc}	5.37	152.40^{ab}	—
17. Cucumber	12.07^{cd}	45.14^{abcdef}	9.70^{fg}	64.00^{bc}	68.25^{cd}	4.24	119.80^{abc}	2.14
18. Small gourd	11.47^{bc}	48.17^{abcd}	9.40^{fg}	47.33^{de}	65.82^{cde}	3.27	104.00^{bcd}	2.19

Figures followed by the same letters are not significantly different from each other by DMRT (P=0.05).

evaluating the host plant preference of *D. indica*. The results are shown in Table 1.

Rate of larval devlopment: Among the 18 cucurbits screened for larval development, the shortest larval period of 9.40 days was recorded on musk melon (Table 1; column 1); it was significantly shorter than the duration required for development on the other hosts. This was followed by long melon, water melon and squash which were on par with each other. The larval periods on sponge gourd (13.13 days), bottle gourd (13.40 days) and pointed gourd (13.86 days) were significantly longer than on other host plants. There was no larval development on spiny gourd.

Larval weight: The weight of larvae reared on the various cucurbits were recorded on the 10th day after hatching; data are shown in Table 1 (column 2). The maximum weight (60.62 mg) was recorded for larvae fed on water melon followed by ivy gourd. The weights of larvae reared on musk melon, squash, small gourd and cucumber did not differ significantly from each other. The larval weight was low when reared on pointed gourd, round melon and ridge gourd.

Duration of pupal period: The duration of pupal period for larvae reared on the various cucurbits is shown in column 3 of Table 1. The shortest mean pupal period of 6.60 days was recorded with squash followed by musk melon. When reared on ivy gourd, pumpkin and ridge gourd it was longer by a day; these were on par with each other. The pupal period was longer still when reared on small gourd, ash gourd, sponge gourd, bottle gourd and bitter gourd.

Success of pupation: The number of larvae that developed and pupated successfully on the various host plants were recorded and the extent of pupation calculated from this data. The maximum percentage pupation was obtained with squash (77.33%), followed by ivy gourd, pumpkin, musk melon and long melon. These did not differ significantly and were higher compared to the other host plants. The pupation rate was low with bottle gourd, sponge gourd,

pointed gourd, chow-chow and bitter gourd.

Emergence of adults: The percentage emergence of pupae when reared on the various cucurbits was recorded (column 5 of Table 1). Maximum emergence of pupae was recorded for water melon (84.43%) followed by squash and musk melon. Lower emergence were recorded for bottle gourd, bitter gourd, chow-chow, sponge gourd and pointed gourd.

Growth index: To assess the overall capacity of various cucurbits to support growth and development, growth indices were calculated (column 6 of Table 1). The results indicated that musk melon, water melon, squash, ivy gourd, long melon, and pumpkin are better hosts than the other cucurbits. The growth indices of cucumber, snake gourd, small gourd and ash gourd were lower. The growth indices for cucurbits, viz. sponge gourd, chow-chow, Pointed gourd and bottle gourd were very low, indicating that these plants are probably not preferred hosts but in the absence of the preferred hosts *D. indica* can survive on these cucurbits.

Fecundity: The fecundity of females reared from the various plants was determined (column 7 of Table 1).

The study indicated that the maximum number of eggs were laid by moths reared on musk melon (198.0), followed by, ash gourd, water melon long melon and ivy gourd. The lowest number of eggs were from moths reared on sponge gourd, chow chow, bottle gourd, round melon, pointed gourd and bitter gourd.

Effect of host plants on field infestation: 15 cucurbits raised in the field were sampled for natural infestation of *D. indica*. The plants raised in pandals (Bower system), viz. snake gourd, ivy gourd and bitter gourd were not included in the sampling since the sample units between these two types of cultivation were not uniform.

The mean number of full grown larvae per plant are shown in the last column of Table 1. High larval population occurred on musk melon (3.98), followed by long melon, water melon, squash and pumpkin. Sponge gourd, pointed gourd and spiny gourd did not harbour any larvae at all which indicated that these are not attacked when more preferred hosts were present.

Based on the above observations on host preference of *D. indica* it is possible to classify the 18 cucurbits into three broad categories.

(a) *Most preferred hosts*: Musk melon, long melon, water melon, pumpkin, squash and ivy gourd.
(b) *Moderately preferred hosts:* Cucumber, small gourd, snake gourd, ash gourd, round melon and ridge gourd.
(c) *Least preferred hosts*: Bitter gourd, bottle gourd, chow-chow, pointed gourd and sponge gourd.

Ayyar (1923) and Fletcher (1914) reported the occurrence of *D. indica* as a pest of cucurbitaceous plants. Pandey (1975) refuted this observation on the grounds that in his investigations at Bharwari, where seven cucurbits were screened, *D. indica* did not develop on bitter gourd. The development on the other hosts, viz. musk melon, round melon, pumpkin, watermelon, sponge gourd and ridge gourd was quite normal, and among these plants the percentage of larval pupation was highest on musk melon and lowest on ridge gourd. In the present study *D. indica* completed its development on bitter gourd, while sponge gourd was the least preferred host. *D. indica* failed to develop on spiny gourd.

Krishnaprasad and Rai (1978) screened five cucurbits, bitter gourd, bottle gourd, pumpkin, ridge gourd and snake gourd. Ridge gourd was the most preferred host plant followed by snake gourd, pumpkin and bottle gourd. The variation reported in the most preferred host by Pandey (1975) and Krishnaprasad and Rai (1978) is interesting. The former recorded musk melon as the most preferred and ridge gourd as the least preferred, while the latter reported ridge gourd as the most favoured host. In the present study *D. indica* developed on bitter gourd contrary to the report

of Pandey (1975). Similarly, bottle gourd was reported as a favourable host by Krishnaprasad and Rai (1978), while in the present investigation it has been classified under the least preferred. The development reported by these authors on the other cucurbits, viz. ridge gourd, pumpkin and snake gourd are more or less in conformity with the present study.

Considering the extent of variation in the insect host plant interaction of *D. indica* reported in literature, it may be concluded that probably all cucurbits are potential hosts of this insect. The earlier reports by Fletcher (1914) and Ayyar (1923) that most cultivated cucurbits are susceptible to *D indica* appears to be authentic in the light of the present findings. The rather contradictory results obtained in relation to development may be due to the varieties and regions selected for this experiment. However, since the varietal names of many of the cultivated cucurbits are not given it is difficult to determine whether or not a particular cucurbit is a potential host. We can only assume that all cucurbits are potential hosts of *D. indica* but some cucurbits (like musk melon, long melon, water melon, ivy gourd etc.) are better than others (bottle gourd, bitter gourd etc.).

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